Citation:

Kaylegian KE, Moag R, Galton DM, Boor KJ. Raw milk consumption beliefs and practices among New York state dairy producers. *Food Protection Trends*. 2008; 28: 184-191.

Study Design:

Cross-sectional survey

Class:

D - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To determine raw milk consumption beliefs and practices among New York State dairy producers.

Inclusion Criteria:

New York State dairy producers.

Exclusion Criteria:

- Out-of-state farms
- Veterinarians
- Processing plants
- Respondents who no longer lived or worked on a farm.

Description of Study Protocol:

Recruitment

The survey was sent in two mailings to Cornell University dairy industry extension services clientele.

Design

- A survey was developed to assess current beliefs and practices regarding raw milk consumption
- The survey contained eight questions, several of which had multiple parts
- The survey questions were developed to collect information on the demographics of all respondents (e.g., whether they own or worked on a farm), their household milk consumption practices in the previous year (e.g., whether they drank raw milk, pasteurized milk or both and the quantity of milk consumed), reasons for consuming or not consuming raw milk, demographics of milk consumers (e.g., number and ages of people, how long they have or have not consumed raw milk), whether or not dairy producers supplied raw milk to

others in the community beyond their own household members and the demographics of community raw milk consumers, concerns about raw milk consumption and calf-feeding practices
- The specific working and order of the questions were evaluated by university personnel from multiple disciplines and then tested by a select group of dairy producers to ensure that the language was appropriate for the audience and that all of the desired information would be captured
- The survey was sent in two mailings, a requested timeframe of three weeks was given for return of the survey and a self-addressed, stamped envelope was provided.

Statistical Analysis

- The survey resulted were tabulated in Excel spreadsheets
- The data was sorted and percentages and statistical T-tests were calculated with the Excel spreadsheets
- Chi-square analyses were conducted with Internet software provided by Quantitative Skills
- Data from each respondent were included in all analyses except for information related to provision of raw milk by a farm to members of the community, as some farms were represented by more than one survey respondent. For responses to this question, a total of 19 farm replicates were identified and removed to ensure that no farm would be multiply represented as providing raw milk to the community.

Data Collection Summary:

Timing of measurements: Survey respondents were given three weeks to respond.

Description of Actual Data Sample:

- *Initial N:* 448 surveys were mailed out
- Attri*tion (final N):* 196 responses were received. The data set was adjusted to only include New York State dairy producers and farm workers, which represented 336 mailed surveys and 150 responses
- *Location:* New York State.

Summary of Results:

Key Findings

- Demographics of raw milk consumers:
  - Dairy producers represented the majority (89.7%) of raw milk drinkers; the remaining 10.3% were farm workers
  - 72% of raw milk consumers reported living on the farm; there was no significant relationship between residence on the farm and consumption of raw milk among the respondents ($P>0.05$)
  - In general, raw milk consumers were more likely ($P<0.05$) than pasteurized milk consumers to be associated with smaller farms (i.e., the average size and median number of cows on the farms with raw milk consumers was 531 and 280 for raw milk consumers, and 806 and 600 for pasteurized milk consumers)
  - A total of 225 raw milk drinkers were reported among 66 farm households

- Approximately 64% of the raw milk consumers were between 21 and 65 years of age and approximately 16% were under 10 years old
- Household sizes ranged from one to 12 persons, with an average of four persons
- Most households had one or two people who were either between 21 and 40 years old (44 households) or 41 and 65 years old (33 households); 22 households had children under 10 years old

- Milk consumption habits of raw milk consumers:
  - Most (76.5%) raw milk drinkers indicated that they had been drinking unpasteurized milk for more than 21 years, 2.9% for six to 10 years, and 5.9% for less than five years
  - The 68 raw milk consumers represented 45.3% of the survey respondents; for those respondents, raw milk was obtained from the producers' bulk tank
  - A total of 68 (45.3%) respondents reported consuming fresh, raw milk from the farm, whereas 82 (54.7%) respondents stated they had not consumed raw milk in the previous year
  - Of 68 raw milk drinkers, 33 (50%) obtained milk solely from the farm, whereas 33 (50%) also purchased some commercially processed (e.g., pasteurized) milk from a store
  - Two respondents who did not consume raw milk reported pasteurizing their own milk on the farm prior to consumption; the remaining 80 pasteurized milk drinkers obtained all of their milk from a store
  - The average quantity of milk consumed per week did not differ between raw and pasteurized milk households; consumption was 4.1 gallons per week and 3.5 gallons per week, respectively
- Reasons for consuming raw milk:
  - Of the 68 raw milk drinkers, 66 reported reasons for consuming raw milk and generally provided more than one reason; the primary reasons given for consuming raw milk were taste (56 responses, or 84.8%), convenience (53 responses, or 80.3%) and cost (38 responses, or 57.6%)
  - Approximately 11% consume raw milk for other reasons, such as "the family likes it better," "freshness," "they ran out of store milk," "they want the higher fat for butter making" or that it "was from grass-fed cows"
- Health concerns about consuming raw milk:
  - 38.2% (26) of the raw milk-consuming households responding to the survey (representing 68 people consuming raw milk) expressed health concerns about raw milk
  - 73.2% (60) of the pasteurized milk-consuming households responding to the survey (representing 82 people consuming pasteurized milk) expressed health concerns about raw milk.

Other Findings

- Provision of raw milk to farm workers and the community:
  - The 150 surveys from New York State farms represented 131 individual farms
  - Of the 131 farms, 39 (29.8%) farms provided raw milk to the community and 88 (67.2%) did not; four respondents did not answer this question
  - Of the 39 farms, 27 (69.2%) farms supplied raw milk to farm workers, 14 (35.9%) farms supplied raw milk to extended family members, 11 farms (28.2%) supplied milk to neighbors and three farms (7.7%) supplied raw milk to tourists or local consumers with a preference for raw milk
  - Producers were asked if farm workers considered access to raw milk to be a job

benefit. Of the 34 producers that addressed this question, 10 (29.4%) thought that farm workers did consider access to raw milk as a benefit of their employment, nine (26.5%) did not, and 15 (44.1%) did not know.

- Findings on pasteurized milk consumers:
  - The 82 pasteurized milk consumers represented 54.7% of the survey respondents
  - Dairy producers comprised the majority (90.2%) of pasteurized milk drinkers; the remaining 9.8% were farm workers
  - 69% of pasteurized milk consumers reported living on the farm
  - Of the previous raw milk drinkers, 10.7% stopped drinking raw milk in the past five years, 44.6% stopped six to 10 years ago, 23.2% stopped 11 to 15 years ago, 10.7% 16 to 20 years ago, and 10.8% more than 21 years ago
  - Of the 82 pasteurized milk drinkers, 81 reported the reasons they did not consume raw milk and often gave more than one reason
  - The primary reason for not consuming raw milk was health concerns
  - Of the 63 respondents who did not drink raw milk because of health concerns, 56 provided specific reasons and often more than one reason
  - Among the 56 respondents, 83.9% gave a combination of concerns regarding the avoidance of bacterial illnesses, a desire to drink pasteurized milk or the perception that drinking raw milk is “risky.”

Author Conclusion:

- A survey on milk consumption practices of 150 New York state dairy producers showed that 45% had consumed raw milk in the past year and 55% had not, although the majority of those who currently consume pasteurized milk products had consumed raw milk more than a year ago
- The primary reasons for consuming raw milk were taste, convenience and cost
- Both raw and pasteurized milk consumers had concerns related to the potential for acquiring bacterial illnesses from raw milk consumption, with concerns about *E. coli* and *Salmonella* spp. infections reported most frequently
- For those choosing to consume pasteurized milk, the primary reason for not drinking raw milk was concern regarding the potential for contracting bacterial illnesses
- In addition, approximately 32% of the respondents who consume pasteurized milk do not consume raw milk because of its higher fat content compared to other commercially available milk products
- Although 34 respondents reported heating-treating milk that is fed to calves, nine of these 34 also reported consuming raw milk in their own households
- The results from this survey identified multiple concerns regarding the potential for human illnesses associated with raw milk consumption
- Some farm families continue to consume raw milk despite health concerns
- Scientifically-supported educational materials targeted to dairy producers and other milk consumers that provide factual information on the potential for illness from raw milk consumption, as well as other properties of milk, will allow consumers to make informed decisions regarding the consumption of raw milk products.

Reviewer Comments:

- *The raw milk consumption practices of dairy farm producers and farm workers may not represent the beliefs and practices about raw milk of typical consumers*

- *Generalizability of these results may be difficult, as the survey was only in one state. Results may not be indicative of raw milk practices in other states*
- *It may have been useful to know if respondents had any history or experience with raw milk-related illness. This may influence their choice in consuming raw vs. pasteurized milk and what their health concerns may be.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	N/A
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	???
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	???
2.2.	Were criteria applied equally to all study groups?	N/A
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	No
3.	**Were study groups comparable?**	N/A
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A

3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	N/A
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	N/A
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	No
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	No
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	N/A

6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	N/A
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	N/A
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	N/A
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	???
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	???
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	N/A
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	???
7.5.	Was the measurement of effect at an appropriate level of precision?	???
7.6.	Were other factors accounted for (measured) that could affect outcomes?	???
7.7.	Were the measurements conducted consistently across groups?	N/A
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A

8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	???
8.6.	Was clinical significance as well as statistical significance reported?	N/A
8.7.	If negative findings, was a power calculation reported to address type 2 error?	N/A
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	No
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	No
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes